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# **BIOSECURITY & THE ORNAMENTAL FISH INDUSTRY**



# Biosecurity & the ornamental aquatics industry

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## Introduction

Biosecurity is a broad topic which encompasses many different issues, including disease prevention and invasive species, and refers to the measures taken to prevent the spread of harmful organisms. Therefore, it can refer both to the spread of disease and the introduction of non-native species. Good biosecurity is essential when working with live fish, plants and invertebrates as it enhances animal welfare, prevents damage to native ecosystems and reduces losses from your stock.

This guidance highlights the key issues around both disease and invasive species that are specific to the ornamental aquatic trade. The information in this document will help all aquatic businesses improve their biosecurity standards. It is important to note that whilst this is aimed at helping all aquatic businesses, those designated as Aquaculture Production Businesses (APBs) may be required to undertake additional biosecurity practices not outlined here. If there is any confusion as to your obligations as an APB, please contact the Fish Health Inspectorate (FHI).

Where possible we want to provide examples of good management techniques to help prevent, manage and rectify biosecurity issues faced by aquatic businesses. There are also extra resources found in the appendices. Some of these will be referred to in text, others are more general tools to improve biosecurity.

Once you have read this guide check out your business's biosecurity risk by doing our Biosecurity Risk Assessment Tool which you can find on the [OATA website here](#). This will help you to identify areas which you need to work on and you can refer back to this document on how to tackle them.

OATA recommends using the content of this document and the results generated by the accompanying risk assessment tool to produce a biosecurity plan for your business. This can be in any format but you could use the table found in Appendix 6. Your biosecurity plan should identify the potential biosecurity threats that could enter, occur or spread from your business and the mitigation measures taken to prevent them. Having specific members of staff responsible for managing your businesses biosecurity can be a useful way to ensure biosecurity standards are implemented. APBs are required to produce a biosecurity measures plan which is bespoke to their site. For details, templates and guidance on producing a biosecurity measures plan, please contact FHI.

## Common elements

Although biosecurity threats are diverse, there are several common themes which will improve biosecurity in your business regardless of the specific issue.

### Risk

The most important element of biosecurity is evaluating the risk of biosecurity threats you face from other businesses and those which you might cause through your practices. This



can be broadly broken down into three key areas: entry, internal spread and transmission of biosecurity threats.

Reducing the risk of any disease or invasive species entering your facility is paramount. Disease or invasive species cannot affect your business if they do not enter it. Reducing the likelihood of biosecurity threats entering your business can be achieved by:

- ▶ purchasing through trusted suppliers
- ▶ checking your shipments
- ▶ effective quarantine and preparation for sale procedures

Although reducing the risk of biosecurity threats entering is crucial, no system or method will eliminate all risk and so appropriate methods should be incorporated to limit the spread of any biosecurity issue within your facility should it enter. This can be achieved through:

- ▶ effective system design
- ▶ appropriate disinfection procedures (including personal hygiene)
- ▶ meeting high welfare standards

Reducing the chance of onward transmission of biosecurity threats is also important. While other businesses should have their own biosecurity plans, they are rarely 100% effective. It is therefore essential to make sure you do not accidentally ship organisms with diseases, parasites, pests or potentially invasive species. Make sure you reduce biosecurity threats to other businesses, your staff, consumers and the environment by:

- ▶ adhering to high biosecurity standards
- ▶ shipping animals and plants in the appropriate manner
- ▶ disposing of waste appropriately

Reducing the risk of biosecurity threats usually comes with a financial cost. Therefore, it is important to identify the specific threats your business may face and balance those with the cost of reducing them. For example, if you import aquatic plants it would serve little benefit to add an ultraviolet steriliser to your systems as plants are generally unaffected by free swimming parasites. However, if you sell marine fish from multiple different sources, an ultraviolet steriliser is a key piece of equipment to reduce parasite populations. Not installing a steriliser could be catastrophic as it could result in mass infection and onward spread of parasites. Use OATA's Biosecurity Risk Assessment Tool on our website to help evaluate what risks you face and their potential severity.

#### Know your supplier(s)

**One of the most effective and simplest measures to improve biosecurity is to buy from trusted suppliers who sell correctly identified, healthy stock.**

Ensuring you are buying healthy individuals of the correct, legal species will reduce the likelihood of disease or invasive species being introduced into your business. Avoid



ordering species if you are not 100% sure of what they are or where they have come from. The importance of this cannot be overstated as this will help to massively reduce the risk of most biosecurity issues before they enter your business. Developing relationships with suppliers is important so that you understand how they operate and to be sure you consistently receive good quality livestock. It is important to understand where your supplier has sourced their stock from, as wild caught and captive bred sources will present different risks. Choosing suppliers with short supply chains is also beneficial. The less links there are in the supply chain, the lower the likelihood of livestock being exposed to disease or the incorrect species being included in a shipment. If you are concerned about the number of points that livestock could be mixed in the supply chain, contact your supplier and ask what mitigation measures they take to ensure good biosecurity. Additionally, it is usually not sensible to accept livestock returns from customers unless you have the capacity to quarantine and, if necessary, treat as new stock. This is because it is not known what disease they may have encountered in a customer's home aquarium and so have high potential for disease introduction. Placing them straight back into your own systems may directly introduce disease, making many other biosecurity controls redundant. Diseased stock may also be bought into a retailer for disease identification. This is not recommended as it poses a significant biosecurity threat, use photos and videos where possible. If any diseased fish are bought into a retailer, they should not be placed on the same surfaces where newly sold livestock are bagged for sale and thorough disinfection should be carried out afterwards. Similarly, any water bought in for testing should be kept in a separate area, away from systems and disinfection of surfaces, equipment and hands should be carried out after testing.

### Checking shipments

It is recommended that the quality of all shipments should be recorded and regular feedback reported to suppliers. Feedback should include the general condition of fish and any mortalities or disease issues. This will allow suppliers to monitor their efficiency and solve any issues as soon as possible. Businesses that import livestock directly should clean the outside of the boxes before they enter the facility as they may have been kept in damp environments that could pose a biosecurity risk. Additionally, packing materials such as bags or liners should be disposed of appropriately and not reused.

Although responsible suppliers will make every effort to ensure the correct, healthy stock are shipped, accidents can happen and unforeseen circumstances may affect the health status of livestock in transit. Ensuring you receive the species you ordered, and there are no unwanted hitchhikers, is an important part in ensuring that invasive species are not traded. Checking all shipments provides a chance to inspect the health of livestock and, if there is any sign of disease, corrective action can be taken sooner and the affected stock isolated from the main stock. Catching any issues early on improves the likelihood of successful treatment and prevents contact with healthy individuals. Checking all shipments also allows the monitoring of suppliers and issues with particular suppliers can be picked up quickly,



enabling you to alert them to the issue and potentially avoid using them in the future if remedial action has not been taken. Should any issues with invasive animal species be found in your shipments or if there are any notifiable disease issues you should contact Fish Health Inspectorate (FHI). If there are any issues with an invasive plant species in your shipment, you should contact GB Non-Native Species Secretariat (GBNNSS). Details for both organisations can be found in “Who to alert?” below.

### Quarantining

Even if the seemingly healthy, correct stock has been purchased, disease may not always be visible. As such, it is important that livestock is quarantined to prevent any undetected diseases entering your systems. This is especially important when importing cold water species, (see “KHV” and “SVC” below), as the likelihood of disease spread to native wildlife is increased. Some suppliers may quarantine stock before it is shipped, so it is important to establish any quarantine practices that already occur in the supply chain.

Quarantine systems should be kept completely isolated from other systems. Additionally, specific quarantine systems should have a dedicated set of equipment (i.e. nets, buckets, siphons, sponges, footwear etc.) and should only be accessed by trained staff. Hands should be thoroughly sanitised when moving between systems and an ultraviolet steriliser or ozone should be considered to effectively isolate stock and prevent pathogen transfer. Where possible it is also useful to perform all maintenance tasks on quarantine systems after all others to minimise moving wet hands between systems, even if they are being sanitised.

Whilst quarantining is generally thought of as a technique to prevent disease it can also be useful to check shipments for invasive species or hitchhikers which may be harder to spot in larger shipments. Additionally, it allows for the detection and treatment of pathogens which may become invasive should they escape into native waters.

The time required in quarantine is dependent on the outcome you are trying to achieve. Therefore, it is important to understand the species involved, their source and any specific risks to ensure stock remains in quarantine for the appropriate amount of time.

### Preparing for sale

Species which may have notifiable diseases should be quarantined as above, as can any other species which your business feels could cause a biosecurity issue. However, many species of fish will not require a full quarantine procedure to be conducted before sale. OATA recommends that all fish are rested before being sold. This will vary depending on the source and the species involved. Sensitive species of fish or individuals with long supply chains may take longer to adjust to their new surroundings, recover from shipping and adapt to new aquarium feeds and light levels. This may be done to some degree by other businesses further up the supply chain, so it is important to check whether this has been done first with your supplier. In these cases, a degree of isolation between resting aquariums/ponds and retail aquariums/ponds can be achieved through a very high dose of



ultraviolet light or ozone (see “Ultraviolet sterilisers and ozone”). Remember, stressed fish are more susceptible to disease so take all steps to reduce this when introducing new stock.

### System design

One of the main ways to improve biosecurity is through effective system design. It can prevent the spread of disease and invasive species and effective system design should be employed where possible. Adequate quarantine and preparation for sale systems and ideally different aquariums/ponds for species from different sources is key in preventing biosecurity issues. The requirements of your retail systems will be dictated by the species you are dealing with, and biosecurity measures you have taken. For example, if selling fish from various suppliers without incorporating a quarantine or preparation for sale plan, individual retail aquariums/ponds will help prevent the spread of any undiscovered disease between aquariums/ponds. However, a strong quarantine or preparation for sale procedure and a limited number of suppliers could mean that multiple aquariums/ponds on the same system is a suitable choice. If choosing to have multiple aquariums/ponds on the same system, an ultraviolet steriliser or ozone unit can achieve some degree of isolation between aquariums/ponds. Always select the appropriate type of UV steriliser as the larger models designed for ponds are designed to improve water clarity, not reduce disease spread. Effective system design also ensures water quality is high by reducing suspended solids, removing ammonia and nitrite and regulating oxygen content. Good water quality reduces stress and is crucial in preventing disease outbreaks.

Preventing wildlife from entering your site is important as they can bring disease into your business or transfer it from your systems to wild populations. It is also important to limit the use of any natural water sources. These could introduce disease, pollutants or unwanted species into your business and could also be a method for invasive species spread into native waterbodies. Ensuring that all drainage goes to sewerage for treatment will limit this risk, if this is not feasible for your business you will need to set up appropriate disposal plans relevant to your biosecurity risk. If in doubt, contact OATA for more guidance ([info@ornamentalfish.org](mailto:info@ornamentalfish.org)).

System maintenance should be regular and well organised so that tasks are not forgotten and the system is functioning effectively. More information on system design and maintenance can be found in OATA’s training programmes, including our Non-Native Species and Biosecurity Training Module.

### Monitoring

A frequently overlooked part of managing biosecurity is monitoring. Assessing risks and preventative measures is not a task which just needs to be carried out when setting up a business or after there has been an issue. The monitoring of biosecurity should be frequent and ongoing because biosecurity risks will change during the natural operation of your business:





- ▶ Your supplier may change their suppliers
- ▶ Your supplier might change staff and management practices
- ▶ A new species is classified as invasive
- ▶ One off events (i.e. delays) can cause disease issues
- ▶ Seasonal changes in species stocked (i.e. pond season)
- ▶ Stocking densities will increase when shipments arrive

Therefore, consistent record-keeping and regular reviews are crucial to allow constant refinement of your biosecurity management. It may also allow you to spot trends which could be missed. For example, you may notice that after importing from a specific supplier, there is a minor whitespot breakout the week after. Regular monitoring allows you to identify and rectify any long running issues. It also lets you monitor the effectiveness (or otherwise) of treatment/medication regimes.

### Selling responsibly

One of the most important roles aquatic businesses can play in improving biosecurity generally is to responsibly sell to end consumers. Appropriate preparation of fish for sale, not selling incompatible species, educating hobbyists in water quality and stocking levels helps to prevent outbreaks of disease in home aquariums. This improves fish welfare, limits disease transfer within the hobby and keeps retail customers enthused about fishkeeping.

A key factor to consider is the appropriate selling of species. There are occasional reports of fish keepers who have released ornamental specimens into the wild which have grown too large for their aquarium. Although this is uncommon, it does present a risk to native biosecurity. Ensuring end consumers understand the adult size of large species and ensuring new stock are compatible with existing inhabitants will limit this practice. In addition, businesses can help educate hobbyists about the need to ensure aquarium or pond plants and animals are not allowed to escape or are released into the wild. Selling appropriate plant species is also important as invasive species can easily spread from garden ponds to native habitats. For this reason, aquarium plants should only be sold for aquariums and not placed in ponds or outdoor habitats. All retailers have a responsibility to ensure the species they offer are legal and can be looked after appropriately.

Another important factor is selling the correct species for the environment it will be living in. Some species of fish (for example *Ozyrias* species) are only legally allowed to be sold for indoor aquariums. All species on the ILFA list of permitted species can only be kept in indoor aquaria, see “Import of Live Fish Act (ILFA)” below for a link to the list. Consumers placing these species in outdoor ponds are committing a crime and run the risk of the species becoming invasive. Similarly, consumers should be educated that aquarium plants should not be placed in ponds otherwise they may become invasive. Educating end consumers on correctly housing livestock is crucial to prevent introductions into native ecosystems.





**It is imperative that businesses only sell legal species. The best way to ensure this is to order stock using scientific names to prevent any illegal species being sold by accident.**

## Disease

### Legalities

There are several pieces of legislation that are associated with fish disease:

#### *Aquatic Animal Health Regulations 2009*

Primary legislation that the relevant competent authorities operate under which aim to prevent the occurrence of and control the spread of serious notifiable diseases. Also contains a remit to investigate and control if necessary, potential emerging diseases. Notifiable diseases are generally incurable and have the potential to cause serious losses in aquatic animals. Anyone who suspects the occurrence of a notifiable disease is legally required to notify the competent authority (FHI). Details can be found below in "Who to alert". More information on the Acts can be found below:

- ▶ England and Wales: [The Aquatic Animal Health \(England and Wales\) Regulations 2009 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukhr/2009/1200/engandwales/regulations)
- ▶ Scotland: [The Aquatic Animal Health \(Scotland\) Regulations 2009 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukhr/2009/1200/scotland/regulations)
- ▶ Northern Ireland: [The Aquatic Animal Health Regulations \(Northern Ireland\) 2009 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukhr/2009/1200/northernireland/regulations)

More information on the notifiable diseases and the disease status of each country can be found below:

- ▶ England and Wales: [Listed diseases of fish, molluscs and crustacea and their status - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/listed-diseases-of-fish-molluscs-and-crustacea-and-their-status)
- ▶ Scotland: [Health status of fish and shellfish diseases in Scotland - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/health-status-of-fish-and-shellfish-diseases-in-scotland/pages/1-1-introduction.aspx)
- ▶ Northern Ireland: [Aquatic disease status | Department of Agriculture, Environment and Rural Affairs \(daera-ni.gov.uk\)](https://daera-ni.gov.uk/en/aquatic-disease-status/)

#### *Animal Welfare Act 2006*

The Animal Welfare Act 2006 states that all pet owners have a legal duty of care to their pets. Anyone who is cruel to an animal or is found not to be providing the five animal welfare needs, as listed below, can be prosecuted.

1. A suitable environment e.g. appropriately sized tank (with water heater if tropical set-up) within a suitable location in your home.
2. A suitable diet which meets the needs of your chosen fish.



3. Behaviour – Fish are able to exhibit their normal behaviour e.g. hiding places for timid fish, enough room for fish to swim freely.
4. Companionship – Ensure you know whether your chosen fish need to be kept with, or apart from, other fish.
5. Health – Protected from pain, injury, suffering & disease e.g. you are aware of the daily, weekly and monthly maintenance that your aquarium will need.

Disease is mentioned in particular, but the other four welfare needs will help to prevent disease occurring. More information on the Act can be found here:

[Animal Welfare Act 2006 \(legislation.gov.uk\)](http://legislation.gov.uk)

#### *Biosecurity measures plan*

A biosecurity measures plan is a legal requirement of an Authorised Importer and Exporter (with the Fish Health Inspectorate, Cefas for England and Wales), importing ornamental coldwater fish. The content of this document, in particular OATA's Biosecurity Risk Assessment Tool ([find it here on the OATA website](#)), will help you complete this. A link to a template biosecurity measures plan can be found on the link below.

[Importing or moving live fish and shellfish – GOV.UK \(www.gov.uk\)](http://www.gov.uk)

#### *Disposal of mortalities*

A derogation from the "Animal By-Product controls under Regulation (EC) 1069/2009 and Commission Regulation (EU) 142/2011", allows the disposal of dead fish placed in sealed plastic bags to go to landfill in the refuse bin. The full regulation can be found here:

[Derogations from Animal By-Product controls under Regulation \(EC\) 1069/2009 and Commission Regulation \(EU\) 142/2011 \(publishing.service.gov.uk\)](http://publishing.service.gov.uk)

#### Background knowledge

##### *Fish immune system*

The most important factor to control aquatic disease is the species' immune system. The functioning of fish immune systems is highly complex – detailed explanations on fish physiology/biology can be found in our training ([Training - OATA - The Ornamental Aquatic Trade Association \(ornamentalfish.org\)](#)).

However to simplify this, the key factor in insuring immune systems function effectively is to minimise stress. Placing a fish under stress increases hormones in the body which reduce the efficacy of the immune system. Stress can come from many sources but the most common are:

- Incorrect or rapidly changing water chemistry
- Less than ideal temperature
- Aggression from tank mates



- Isolation (if a social species)
- High stocking densities
- Intense lighting
- Lack of shelter
- Poor diet
- Poor handling

To ensure fish are resistant to disease, it is imperative that stress is reduced wherever possible. Low stress levels will allow fishes' immune systems to function effectively and will reduce the likelihood of disease, even if they are exposed to a pathogen. An important area to consider is acclimation of fish. Fish which have been shipped are likely to be stressed and may be exposed to pathogens they have not encountered before when they enter new waters. Therefore, it is crucial that appropriate acclimation procedures are followed to allow fish to recover. It is also important to remember that because many diseases will break out when fish are stressed, simply treating the disease may not resolve the underlying conditions that caused it. Without remedying the underlying stressors, it is likely disease will return.

#### *How disease spreads*

Pathogens are micro-organisms that cause disease. They are diverse and can spread in different ways through fish populations. The most common methods are through skin-to-skin contact between fish, infection by parasite, infection of open wounds, entry through the gills or ingestion.

To mitigate the chances of disease outbreak affecting multiple fish, it is important to reduce its ability to spread. For example, overstocking leads to increased fish contact, suspended solids clog gill filaments and poor quality live food may contain pathogens. Ensuring your fish are stocked suitably, kept in high quality water and fed safe feeds will reduce the chances of disease spreading between individuals.

Another factor that affects the likelihood of disease spread is the population of pathogens in any given system. Low pathogen levels are very common in populations and it is important to consider all livestock as a potential source of disease, even if they are symptomless. However, the more infected fish or the more advanced infections there are will increase the number of pathogens. The most obvious way to reduce pathogen levels is to remove and isolate any fish showing signs of disease and remove mortalities – and the earlier the better. Pathogen levels in a population can also be reduced directly (through water changes, the use of ultraviolet or ozone, disinfection procedures and medications) and indirectly (good water quality, prompt removal of physical waste and diseased or dead individuals alongside limiting the use of poor-quality live feeds).



**Keeping fish to the highest possible standards will allow their immune system to function effectively and will limit the spread and population of pathogens.**

### Good practice

#### *Health checks*

Daily health checks are required as part of the Licence for Activities Involving Animals (LAIA) (required by any business which sells fish commercially). However, they should be carried out by all businesses working with livestock as a matter of course. Regular (at least daily) health checks allows any signs of illness or disease to be caught early and which will reduce transmission and improve the effectiveness of any treatment required. Using the same checklist will ensure all staff are looking for the same symptoms and will reduce the chance of an issue being missed. It is important that all new staff are trained thoroughly to perform an effective health check. See Appendix 1 for a health checklist which can be used to assess the health of aquatic animals. You can add to this if you deal with specific issues or species on site. Health checks frequency should be increased after any biosecurity issue.

#### *Importance of water chemistry*

**The importance of good water chemistry cannot be overstated. Good water quality will help to prevent disease outbreaks even if there are pathogens present, and most disease outbreaks can be attributed to the stress of poor water quality.**

Although many people may think of water quality as just ammonia or nitrite, it is every parameter of the water. For example, temperatures that are too low or too high will inhibit immune system functioning. The incorrect pH or hardness may cause long term stress. The stability of water chemistry is also important, rapidly changing parameters (even in the right direction) may cause stress which can trigger the outbreak of disease. This is especially important to consider when unpacking livestock. An increase in oxygen can rapidly raise the pH and increase the toxicity of ammonia. Acclimation procedures should account for this. The ideal parameters for various species groups can be found in OATA's care sheets ([Customer care sheets - OATA - The Ornamental Aquatic Trade Association \(ornamentalfish.org\)](http://www.ornamentalfish.org/customer-care-sheets)), however a more general outline can be found in OATA's water chemistry guidance ([Water Quality - OATA - The Ornamental Aquatic Trade Association \(ornamentalfish.org\)](http://www.ornamentalfish.org/water-quality)).

Sometimes freshwater and saltwater baths are used as a treatment for parasites. It is important that the correct salinity is used for the correct species as some (such as catfish) can only tolerate low concentration salt baths. Additionally, freshwater baths should be buffered so that there is not a large difference in hardness between the treatment and aquarium water. Using the incorrect salinity or hardness will cause excess stress and may make individuals more susceptible to disease.





### *Ultraviolet sterilisers and ozone*

Ultraviolet sterilisers and ozone units are both designed to disinfect water in an aquatic system. An ultraviolet steriliser uses ultraviolet light to kill pathogens whilst ozone units create an unstable form of oxygen that will oxidise organisms. Both will kill pathogens effectively and are useful in reducing the likelihood of disease spread between different tanks and ponds but should be used appropriately. Water should be disinfected as close to the return to aquariums/ponds for best results. Sterilisation should not be overused as it may promote overly sterile systems which may reduce immune system functionality and so use and application should be balanced.

Ultraviolet sterilisers		Ozone	
Pros	Cons	Pros	Cons
<ul style="list-style-type: none"><li>▶ Relatively low risk</li><li>▶ Will kill most pathogens</li><li>▶ Easy to install</li><li>▶ Not harmful (unless light escapes)</li></ul>	<ul style="list-style-type: none"><li>▶ High running cost</li><li>▶ May limit water flow</li><li>▶ Might need multiple units</li><li>▶ Regular maintenance</li><li>▶ Produce heat</li><li>▶ Reduced efficacy in turbid water</li></ul>	<ul style="list-style-type: none"><li>▶ Very effective at killing pathogens</li><li>▶ Dramatically improves water clarity</li><li>▶ Very low power</li></ul>	<ul style="list-style-type: none"><li>▶ VERY dangerous if leaked</li><li>▶ Careful monitoring required</li><li>▶ May kill all livestock if overdosed</li><li>▶ Requires reaction chamber</li><li>▶ Excess needs to be removed</li></ul>

As the table shows, there are pros and cons to both methods of disinfection. Ultraviolet sterilisers are far more common than ozone as they are far safer although they will require more maintenance and higher running costs. The use of ozone is not a decision that should be taken lightly as it can cause serious harm to aquatic life, and if it escapes from the water, humans. Alarms should always be used to detect escaped ozone and evacuation plans should be developed.

### *Disinfection*

Disinfection of nets and surfaces (including inside of aquariums and ponds) will help to prevent the spread of pathogens between aquariums or ponds. Cleaning surfaces after livestock have been removed will prevent any new livestock entering from being infected by any pathogens still present. Aquariums and ponds should not be disinfected with livestock inside. Disinfection should be carried out after physical dirt has been removed so that the



chosen chemical has contact with the tank or pond walls and floors. It should be thoroughly rinsed afterwards to ensure there is no residue.

Nets should be disinfected between use, even if aquariums or ponds share the same system. This is especially important as an ultraviolet steriliser or ozone unit may be preventing disease from spreading between aquariums/ponds, but the use of contaminated nets would undermine this. Net disinfection is especially important because they have direct contact with fish skin (a disease transmission route) and catching fish usually involves some level of stress. A protocol for net disinfection can be found in Appendix 2.

The chosen disinfectant should be selected based on contact time. For example, net dips will need a disinfectant with a short contact time so nets can be used frequently. Disinfectants used on aquarium or pond walls could have a longer contact time and thus a different chemical may be used. It is also important to consider the residue left behind after disinfection, and any disinfectants which leave behind harmful substances should be avoided. Finally, some disinfectants have a colour changing capability to alert the user when the active ingredient is no longer effective. This useful feature means users can ensure their disinfectant is always effective. Aquarium treatments are not effective disinfectants as they are designed to tackle a specific pathogen and should never be mixed. A list of appropriate disinfectants for net dips and surface cleaning can be found in Appendix 3.

Additionally, periodically drying both aquariums/ponds and nets is an effective measure. Some aquatic pathogens struggle to survive being dried so this is an excellent way to add an additional layer of disinfection to aquatic equipment.

### *Personal hygiene*

Personal hygiene is important to reduce the risk of disease transfer. Hands and arms should be clean, disinfected and allowed to dry before being placed in another system. Alcohol is probably the best method for this as it dries quickly, kills most pathogens and is readily available. Ensure the alcohol has evaporated before placing your hands in water. If you are handling stock showing signs of disease, it is best to use disposable gloves and then sanitise hands and arms afterwards. On some sites footbaths are a useful addition to stop pathogens being brought in on shoes, however these are impractical for a retail setting. Good personal hygiene will also help prevent the potential spread of zoonotic diseases, see the Zoonoses section below for more details.

### *Isolating stock*

Mixing some species comes with more risks than others. For example, mixing coldwater fish (which might be carrying KHV or SVC) from different suppliers is riskier than mixing tropical fish from the same supplier. Additionally, disease control measures may require all species in contact with each other (i.e. on the same system) to be considered in official controls and so this should be considered. Planning what species are in contact with each



other based on their origin can reduce the chance of outbreak and make tracing the source of a disease easier. Where possible, keep deliveries of new livestock separate from existing stocks to reduce the chance of disease outbreak.

If livestock is exhibiting disease symptoms then they should be isolated in a different, closed system away from any healthy stock. Ensure that the disease is remedied before the aquarium/pond is put back online or the fish reintroduced to healthy livestock. Aquariums or ponds used for this purpose should be disinfected after each use to prevent disease spread to vulnerable stock. It is also useful to have a spare filter matured at all times so that livestock can be isolated at short notice. Failing this remember to frequently monitor water quality and perform changes as required. Any filters, along with any other equipment should be kept separate from other equipment, used for isolating stock only and should be disinfected after each use. If using a treatment, make sure to follow the instructions carefully and complete the entire course, even if symptoms disappear.

#### *Antibiotics in the ornamental industry*

Antibiotic resistance is when a pathogen (such as bacteria or fungus) develops resistance to the drugs designed to kill it. Generally, this stems from the over or incorrect use of antibiotics. If antibiotics are used too frequently or the course is not completed, some pathogens survive each round of treatment. These reproduce and create a strain resistant to drugs, which makes the disease much harder to treat. Bacteria can pass on this resistance just through contact with new populations and resistance can spread even if a population hasn't been directly exposed to the drugs.

Additionally, overuse or prophylactic use of antibiotics can lead to fish having poor immune responses when they are exposed to pathogens.

It is crucial that antibiotics are only used when prescribed by a vet and the instructions are carefully followed. The course should be completed even if symptoms start to improve. Antibiotics should not be used prophylactically, especially when shipping.

Where possible, take care to avoid sourcing stock from suppliers that use antibiotics prophylactically, either during farming or shipping.

Antibiotic resistance is a growing problem both within animal and human health so it is important our industry plays its part in contributing to tackle this issue.

#### *Mortalities*

Despite aquarists' best efforts, sometimes it is best to euthanise a fish to prevent suffering. There are several ways to do this, but the best method is through an overdose of anaesthetic, followed by destruction of the brain after the anaesthetic has taken effect. This is to ensure brain death. Several drugs are suitable for this which are listed below. However, if you are



unsure about which drug to select or have any questions regarding euthanasia it is best to consult with your registered vet.

### **Tricaine methane sulphonate, MS222**

This is currently the only licensed fish anaesthetic agent and should be considered as the first drug of choice. It is available without a prescription, but it may be prescribed if sourced from a vet. Tricaine will cause the water to become more acidic and a pH buffering agent should be added to the solution. Euthanasia dose: 1 gram/litre.

### **Benzocaine**

This chemical is relatively insoluble in water and should be made up as a stock solution with 100 grams of benzocaine in 1 litre of acetone or ethanol. It is available without a prescription. Euthanasia dose: 10 ml of stock solution/litre.

### **2-Phenoxyethanol**

This chemical does not dissolve well in water and must be whisked vigorously to improve its solubility. In the UK, it is available without prescription and sold over the counter. Euthanasia dose: 2.5 ml/litre of active ingredient. If another product is used, then dose for euthanasia according to the manufacturer's instructions.

### **Clove oil**

Found in various fish treatments and also available in pharmacies without prescription, this drug must be whisked vigorously to improve its solubility. It is suggested that the euthanasia dose should be added slowly over a five minute period so as to avoid distressing fish. Euthanasia dose: 10 drops/litre.

Always ensure the fish is anaesthetised before brain destruction is performed. The above method ensures the most peaceful death possible, but there are several unsuitable methods which should be avoided. These include:

- Percussive stunning (unless specifically trained to do so)
- Asphyxiation through CO<sub>2</sub> exposure
- Removal from water
- Maceration
- Freezing
- Flushing

Always dispose of dead animals appropriately (see more on this in the Disposal of Mortalities in Disease section above). They should be placed in sealed plastic bags and placed in general waste sent to landfill. Do not flush them down the toilet or dispose of them in any other water way. If there is a delay between euthanasia and when the refuse is collected, freezing is a good way to store mortalities, but this should not be the method of





euthanasia. If large numbers of fish need to be euthanised, contact your refuse company to inform them. Incineration is used when a known disease event occurs with large scale losses.

### Specific diseases

#### *Identifying diseases*

For all diseases, early and correct identification is crucial for both good biosecurity and for successful treatment which is why daily health checks are recommended. Well-trained staff with good knowledge of the species you deal with are also vital to helping identify disease. There are many different diseases that can affect aquatic livestock, and it is beyond the scope of this document to detail all of them. However, there are some key indicators that should be used to identify potential disease.

#### *Changes in behaviour*

Swimming more frantically, lethargy and reclusiveness could be signs of potential infection. Analysis of this will be very species specific so it is important you have good knowledge of the species you work with. Flashing or scratching on objects in the aquarium is a characteristic sign of irritation and can indicate infection or distress from poor water chemistry. Additionally, fish on the receiving end of aggression are more likely to contract disease and so stocking should be monitored too.

#### *Changes in appearance*

Changes in appearance can indicate stress or disease in fish. Dull colours can indicate some fish are stressed, although this should not be confused with differences between sexes or juvenile colouration. White spots, fluffy growths, open wounds or protrusion of the eyes (“pop eye”) are the most obvious signs of disease and these can be used to diagnose the specific issue. Fish looking particularly skinny or suddenly very large can also indicate disease. Trained individuals can carry out skin scrapes on fish which can indicate parasitic infection.

#### *Changes in respiration*

Changes in gill movements are an important indicator of fish health. Stress results in a higher oxygen demand so increases gill movement speed. Increased gill movement can also indicate issues with water chemistry which is often a precursor for disease. Rapid respiration can be a sign of gill parasites, as fish move water over the gills more frequently to obtain oxygen. Fish with a very slow respiration rate is also something to be aware of as this could indicate weakness or water quality issues. Fish hanging near the surface of the water is a sign of reduced oxygen uptake, either a lack of oxygen in the water itself, or the ability of the fish to extract oxygen from the water (usually associated with disease). Fish should breathe steadily and “deeply”, with minor increases in respiration rate after activity.



### *Changes in appetite*

A healthy fish will eat when offered food. Reduced appetite is usually associated with stress or disease. Fish which continue to eat but are losing weight may be suffering with an internal parasite or other condition. It is important to remember that feeding habits are very species specific and fish may not feed if they are offered the incorrect size or type of food. Fish may take a while to get used to a new type/brand of food. Always ensure you are feeding the correct diet before using feed intake as a sign of disease.

### *Changes in the wider population*

Monitoring the behaviour of all the livestock in the system is important. Effective monitoring of individual fish will increase the chances of solving any issues before they affect others. However, if multiple individuals are exhibiting the same symptoms, it suggests that any observed changes are more likely to be a sign of disease or stress rather than changes in individual behaviour. Fish of different species exhibiting the same changes in behaviour or appearance across different aquariums/ponds is a clear sign of an issue and immediate steps should be taken.

Frequent monitoring of livestock will help to prevent issues causing disease and will increase the likelihood of successful treatment. Many of the factors above will not identify the specific disease, more that there is an issue which needs to be treated. More information on diagnosing fish disease can be found in OATA's training programmes. However, there are two very important diseases in the aquatic trade which are outlined below.

### *Koi Herpes Virus (KHV)*

Koi herpes virus can cause massive mortalities in carp (*Cyprinus carpio*) varieties such as common, leather, mirror carps alongside koi, and ghost koi. It will not harm other fish species. Symptoms of KHV include:

- Only mortalities in carp
- Damaged gills with patches of pale or dead tissue or bleeding gills
- Only carp affected (Do not include stress events such as oxygen drop – applies to sustained losses)
- Mortalities occur when temperature is between 18-27°C
- Mortalities can be rapid (24-28 hours) and affect a very high percentage of the population but also low level and chronic losses can be experienced
- Hanging in the water with reduced fear response
- Sunken eyes
- Pale patches on skin from reduced mucus, fish will feel rough if handled
- Issues with the nervous system (erratic behaviour)
- Secondary infections from other pathogens – particularly in chronic infections



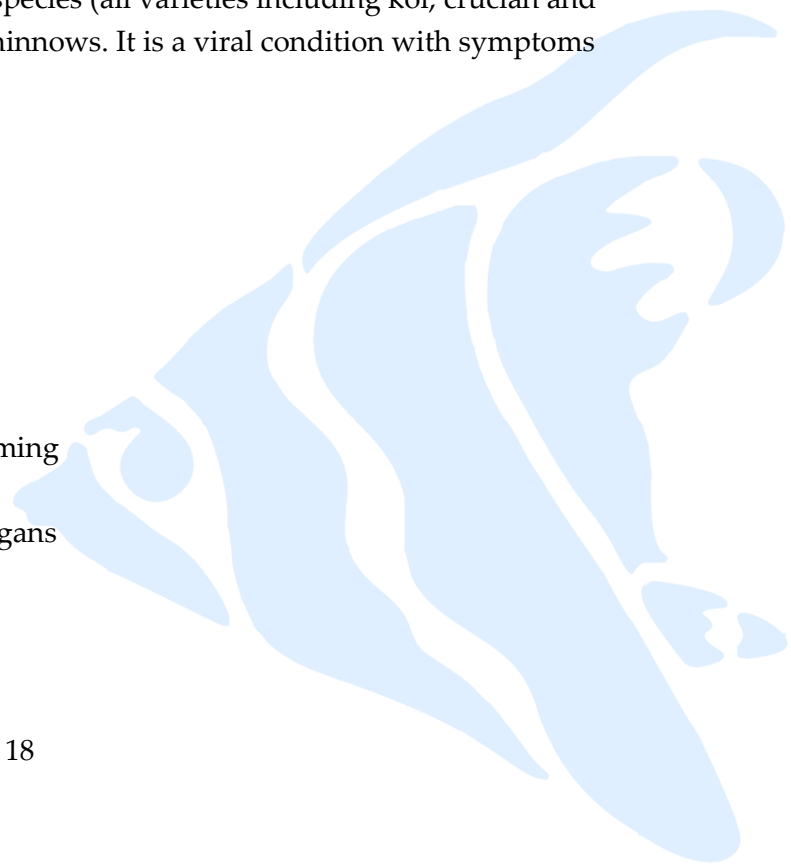
KHV cannot be diagnosed without a laboratory test (either a PCR or an ELIZA), which is performed by the Fish Health Inspectorate (FHI). Currently, there is no cure for KHV and, as it can affect native species, it is a notifiable disease. This means an outbreak or suspicion of an outbreak must be reported to the FHI (details under “Who to alert”) and failure to do so is a criminal offence. FHI will test suspected fish for the disease and advise on the best course of action which may include a temporary closure, limiting fish movements on and off site and disinfection procedures. Recovery from KHV disease can be complicated as fish which have survived the initial outbreak can carry the latent virus and should be considered carriers. This means they can infect new fish placed with them. Currently there is no test to diagnose KHV latency and all surviving carp should be suspected as carrying KHV.

Trusted suppliers can usually give assurances of their protective measures taken to ensure they themselves do not catch KHV. Sourcing stocks from an official KHV free site where possible will reduce the chance of KHV infection. However, the best method to protect your site from KHV is preventative acclimatisation. All sites with good biosecurity should practise some form of quarantine. Keeping carp species between 23-28°C for at least 14 days is a good way to prompt a KHV outbreak if the virus is present. Should this cause an outbreak (confirmed by FHI), the supplier should not be considered suitable. Keeping carp species from different sources separate is important to allow diagnosis of the problem. It is important that the quarantine procedure is absolutely complete and there is effective disinfection of equipment and personnel. Disinfection can be accomplished by ultraviolet light (only effective if all surfaces can be exposed), temperatures over 50°C for more than 1 minute or using any of the disinfectants found in Appendix 3. All water used during preventative acclimatisation should be disposed down the sewer, not into natural waterbodies.

#### *Spring Viraemia of Carp (SVC)*

Spring Viraemia of Carp (SVC), affects carp species (all varieties including koi, crucian and grass), goldfish, bream, roach and rosy red minnows. It is a viral condition with symptoms that include:

- Darkening of skin
- Swollen eyes
- Abdominal swelling
- Pale gills
- Trailing faecal casts
- Protrusion of the vent
- Lethargy
- Loss of balance/uncoordinated swimming
- Hyperactivity
- Bleeding into skin, gills or internal organs
- High losses of up to 80%



Not all symptoms will be present in outbreaks, particularly towards the beginning and end of an outbreak.

The disease is most active in temperatures between 7-17°C and peaks at 10-15°C. However, the disease does not seem to develop at temperatures over 20°C. Usually the disease is brought on by the changing of season from winter to spring but it can also be seen from summer to autumn. The change in temperature combined with the stress of winter can cause outbreaks, particularly in younger fish.

As there is no known treatment and the disease can affect native species, it is notifiable. The Fish Health Inspectorate should be contacted over outbreaks or suspected outbreaks (details under Who to alert section) and failure to do so is a criminal offence. The FHI will perform cell culture with confirmatory tests to confirm an outbreak, a PCR test can be used but only for a quick diagnosis and is not the definitive diagnosis tool used. Following confirmation fish movements from the affected site will be inspected to determine any spread and controls put in place. Controls will be lifted after clearance from FHI (after supervised disinfection or after a period of negative results). The UK is currently clear of SVC, but this does not mean that it is not a threat. The fact that the UK is clear of SVC renders UK populations of fish particularly susceptible to the diseases and given it is considered exotic to the UK, FHI controls will be particularly robust and any stocks considered to be in contact with infected stock will be subject to control measures.

The best way to protect your site from SVC is to use high quality suppliers, have an effective quarantine procedure (of at least two weeks), maintain good water quality and consistently disinfect equipment, containers and surfaces after handling or moving fish. Disinfectants can be found under the KHV section above.

### *Zoonoses*

Zoonoses is the spread of disease between animals and humans. This is unusual in the aquatic industry as aquatic species are very different from us biologically and their diseases have not evolved to infect humans. Good hygiene practices (see prevention below) should help to prevent the spread to humans. There are some specific diseases to be cautious of:

### *Fish Tuberculosis/Mycobacterium*

The most common issue (though incidence is thankfully quite rare) faced by aquarists is 'Fish TB' or 'Myco'. This disease can spread to humans as bacteria are shed from open wounds and intestines of fish into the water. Fish show few symptoms but can exhibit poor growth, weight loss, colour change, lethargy, chronic non-healing ulcers, skeletal deformity, abdominal swelling, lack of coordination or sudden death. In humans it can cause 'aquarist's arm', a condition which can cause non-healing ulcers on hands or arms. Small infections may heal but others will need antibiotic treatment.





## *Vibrio*

*Vibrio* species are bacteria which can be present in both aquatic animals and the water they live in. It is more common in marine and brackish environments. In fish it can cause ulcers, lethargy, skin inflammation and death. If ingested by humans it can cause vomiting and diarrhoea, or inflammation and infection if it enters open wounds. Most people will recover naturally but some may need antibiotic treatment.

## *Aeromonas*

*Aeromonas* bacteria are similar to *Vibrio* species, except they inhabit freshwater. They are transmitted through contact with the bacteria. In fish it can cause ulcers, lethargy, skin inflammation and death. If ingested by humans it can cause vomiting and diarrhoea, or inflammation and infection if it enters open wounds. Most people will recover naturally but some may need antibiotic treatment.

Whilst not strictly zoonoses, there are also diseases and toxins that can affect humans that may be found in aquatic environments such as:

- Salmonella
- Weil's disease (Leptospirosis)
- Cryptosporidium
- Legionella
- Palytoxin (see [How-to-avoid-palytoxin-poisoning-Sept-2022.pdf](https://www.ornamentalfish.org/how-to-avoid-palytoxin-poisoning-sept-2022.pdf) ([ornamentalfish.org](https://www.ornamentalfish.org)))
- Blue green algae

## Prevention

If a system is found to have zoonotic or associated disease, it should be clearly marked and staff made aware. However, good personal hygiene should always be followed to protect against zoonoses and other diseases related to the aquatic environment, even without any specific diagnosis. Staff should:

- Not place open wounds in water
- Not prime a siphon with their mouth
- Use gloves when preparing feed or dealing with mortalities
- Wash hands before eating, drinking or smoking
- Wash hands between systems
- Dispose of waste properly
- Regularly sterilise surfaces and equipment
- Have a separate sink for human use
- Use dedicated equipment for individual systems



## **Invasive non-native species**

### Introduction to invasive non-native species

Invasive non-native species are species not found indigenously which establish and spread causing negative impacts to native species, habitats, ecosystems and people. They can:

- Alter habitats and make them unsuitable for native species
- Predate on native species
- Spread disease to native species
- Outcompete native species for resources

These effects can lead to:

- Damage to infrastructure
- Changing of food webs
- Physical damage to habitats
- Extinction of native species

The cost of invasive species to the GB economy is £1.7 billion annually, including costs to property infrastructure, agriculture and a wide range of other sectors. The most effective way to manage invasive species is not to let them in. The aquatics trade is a potential source of invasive species, as many species kept are non-native. However, as most are kept in indoor aquariums and are from tropical climates, it is difficult for species to escape and survive in native habitats. However, pond plant and fish species pose a slightly higher risk, as they live in UK climates year-round. Either way, plants and animals for aquariums and ponds should be prevented from escaping into the wild and should never be intentionally released. The ornamental aquatics industry has an important role to play in raising awareness about this issue with its customers.

### Legalities

There are four main pieces of legislation to prevent invasive species in the UK:

#### *Import of Live Fish Act (ILFA)*

This Act controls the release of non-native species to protect native species. It specifies the permitted freshwater fish species which can be imported into the UK and their uses. Details can be found here:

- [Import of Live Fish \(England and Wales\) Act 1980 \(legislation.gov.uk\)](https://legislation.gov.uk/ukpga/1980/24)
- [Import of Live Fish \(Scotland\) Act 1978 \(legislation.gov.uk\)](https://legislation.gov.uk/ukpga/1978/24)

The accepted list of species can be found here:

[Introduce or keep non-native fish and shellfish – GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/introduce-or-keep-non-native-fish-and-shellfish)



*Wildlife and Countryside Act (1981)*

[Section 14\(1\) of the Wildlife and Countryside Act](#) makes it an offence to release or allow to escape into the wild any animal which is not ordinarily resident in Great Britain or is listed in Schedule 9 to the Act (which also includes some native animals). It states it is also an offence to plant or otherwise cause to grow in the wild any plant listed in Part II of Schedule 9 to the Act. Section 14ZA of the Wildlife and Countryside Act prohibits the sale of the species referred to in Schedule 9. To see relevant species, please use the following link: [Wildlife and Countryside Act 1981 \(legislation.gov.uk\)](#)

*The Invasive Alien Species (Enforcement and Permitting) Order 2019*

[The Invasive Alien Species \(Enforcement and Permitting\) Order 2019 \(legislation.gov.uk\)](#)

There are many aspects to the Invasive Alien Species Order; however, the main point to be aware of is that it prohibits the use of the species listed in the links below. For these species you must not: keep them in your house, garden or business; sell them to other people; exchange them for goods; release them into the environment; let them breed or escape; import them into the UK; transport them within the UK; or, export them to other countries.

Animals:

- [Invasive non-native \(alien\) animal species: rules in England and Wales – GOV.UK \(www.gov.uk\)](#)
- [ID sheets » NNSS \(nonnativespecies.org\)](#)

Plants:

- [Invasive non-native \(alien\) plant species: rules in England and Wales – GOV.UK \(www.gov.uk\)](#)
- [Invasive non-native plants | NatureScot](#)

*The Prohibition of Keeping Live Fish (Crayfish) Order.*

[The Prohibition of Keeping of Live Fish \(Crayfish\) Order 1996 \(legislation.gov.uk\)](#)

In addition to the crayfish species listed under The Invasive Alien Species (Enforcement and Permitting) Order 2019, under The Prohibition of Keeping Live Fish (Crayfish) Order 1996 you are required to obtain a licence to keep other crayfish species with the exception of the species *Cherax quadricarinatus* (Blue Lobster or Red-Clawed Crayfish), these can kept in indoor aquaria (only) for ornamental use in England & Wales. They are not permitted in Scotland or Northern Ireland.

There are also several other pieces of legislation surrounding invasive species which can be found here:

[Legislation » NNSS \(nonnativespecies.org\)](#)



[www.ornamentalfish.org](http://www.ornamentalfish.org)

### Good practice

The most important guidance for anybody involved in the ornamental aquatics industry is not to release, or allow to escape, any live animals or plants from the ornamental trade into the wild. This message is one which should be spread by business owners to educate consumers.

A lot of the other good practice surrounding preventing the introduction of invasive species has already been covered in the common elements above, particularly:

### *Responsible selling*

Hobbyists are more likely to release species they cannot care for in the long run, particularly animals that grow large or plants that spread quickly. This is one of the most likely routes for invasive species introduction. Retailers should consider what species they stock and ensure they are selling species which can be cared for long term.

### *Checking shipments*

Some invasive species look similar to species which can be legally imported. It is possible that invasive species could be misidentified as legal species and included in shipments. Thoroughly checking shipments for invasive species will help protect against their potential introduction.

### *Knowing your supplier*

Knowing your supplier is trustworthy and supplies healthy, correctly identified stock is important. Incorrectly identified species may be more likely to have invasive species included in them. You should always alert suppliers to any invasive species they supply and consider changing your supply if this is a regular occurrence.

### *System design*

Ensuring your systems are designed properly will help minimise the chance of any invasive species spreading from your business. Any valves removing water from the system should drain into the sewer to prevent accidental introduction. Additionally, placing ponds as far away from any natural bodies and out of flood plains will help reduce the chances of any seeds or plant fragments spreading to natural environments.

### *Monitoring*

Consistent monitoring of the quality of shipments is important to continually assess the reliability of your supplier. Additionally, monitoring the law surrounding invasive species is important as new species may be added. Although OATA aims to keep members up to date, it can be useful for businesses to familiarise themselves with any changes of the law. Information on invasive species can be found here:



Animals:

- [Invasive non-native \(alien\) animal species: rules in England and Wales – GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/topics/invasive-species/invasive-species-rules)
- [ID sheets » NNSS \(nonnativespecies.org\)](https://nonnativespecies.org/)

Plants:

- [Invasive non-native \(alien\) plant species: rules in England and Wales – GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/topics/invasive-species/invasive-species-rules)
- [Invasive non-native plants | NatureScot](https://www.nature.scot/invasive-non-native-plants)

The list of freshwater fish species which can be legally sold for indoor aquaria can be found below. Species not on this list are not legal for sale in the UK. Again, it is useful to monitor this as species may change.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/919683/Copy of ILFA. Aquarium Ornamentals. Alphabetic checklist for BIPs. 1.ods](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/919683/Copy_of_ILFA_Aquarium_Ornamentals_Alphabetic_checklist_for_BIPs_1.ods)

### Who to alert?

If there are any notifiable disease issues or any issues with invasive aquatic animal species contact FHI:

- England and Wales: [Fish Health Inspectorate - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/organisations/fish-health-inspectorate)
- Scotland: [Fish Health Inspectorate - gov.scot \(www.gov.scot\)](https://www.gov.scot/topics/fish-health)
- Northern Ireland: [Fish health and fish health inspections | Department of Agriculture, Environment and Rural Affairs \(daera-ni.gov.uk\)](https://daera-ni.gov.uk/department-of-agriculture-environment-and-rural-affairs)

FHI should also be contacted in the event of a disease which is out of control and responsible for high mortalities, even if it is not notifiable.

If you find an aquatic species you suspect may be invasive, you should report it to FHI and GB Non-Native Species Secretariat (GBNNSS): <https://www.nonnativespecies.org/contact-us/>

If you see the sale of illegal species, contact OATA: [info@ornamentalfish.org](mailto:info@ornamentalfish.org)

Reporting invasive species will help track introduction into the UK and could be used to help locate other individuals to prevent establishment. The relevant authority may also be able to advise you on the best course of action to dispose of individual specimens. If they do not have any specific euthanasia methodologies, euthanise animals as per the advice in this document. For information on disposing of invasive plant species, please see the following links:

[How to stop invasive non-native plants from spreading - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/topics/invasive-species/invasive-species-rules)





[Be Plant Wise » NNSS \(nonnativespecies.org\)](http://nonnativespecies.org)

[How-to-Be-Plant-Wise-pick-the-right-plants-for-your-garden-pond.pdf \(ornamentalfish.org\)](http://ornamentalfish.org)

### **Additional OATA resources**

We would encourage all businesses to use OATA's Biosecurity Risk Assessment Tool which can be found on [OATA's website here](http://oata.org), to help you identify areas that may need more attention on your business. Refer back to this document for advice on how to implement any recommendations made.

OATA has two City and Guilds Accredited Training Programmes (Foundation and Advanced) which are useful for staff, covering water quality, filtration, fish health and fish biology. Good welfare and biosecurity go hand in hand and ensuring all staff have sufficient animal husbandry knowledge will help improve biosecurity. There is also an additional Invasive Species and Biosecurity Training Module which will also be of interest. Well-trained staff are an asset to any business and should improve welfare and biosecurity outcomes.

[Find more on our website.](http://oata.org)



## Appendix 1: Fish health checklist

This is a basic outline for a fish health checklist. It can be added to if required. It is best to print and laminate so it can be used repeatedly.

These fish:	Tick if true:
Are swimming normally	
Are alert and react to stimulus	
Occupy the correct area of aquarium/pond	
Are displaying the correct colour	
Are not more aggressive or submissive than usual	
Are breathing at a steady, easy rate	
Have no changes in appearance (fluffy growths, white spots etc)	
Have clear eyes	
Have no missing scales or sign of injury	
Are in good condition (not too fat or thin)	
Are feeding enthusiastically	



## Appendix 2: Net disinfection protocol

Items required:

- ▶ Multiple nets (at least two, more is better)
- ▶ Disinfectant (See “Disinfection” above for advice on choosing a disinfectant)
- ▶ Two open topped containers (one for disinfectant, one for water)

Procedure:

1. Check to see if disinfectant needs changing. If so, mix disinfectant to manufacturer's instructions.
2. Put all nets in the disinfectant bucket and leave in place for necessary contact period with the disinfectant
3. Before using a net, remove from disinfectant bucket and the wash in the rinse container
4. Shake off excess water
5. After using net, place back into disinfectant
6. If another fish needs to be caught, repeat steps 3-5 with a different net
7. At the end of the day, remove all nets to dry

Considerations:

- ▶ Always ensure there is a supply of disinfectant
- ▶ Staff should be trained on the safe use of the relevant disinfectant with appropriate risk assessments and COSHH forms in place
- ▶ Ensure open topped disinfection buckets are kept away from members of the public and any animals that might enter the store, such as children and dogs.
- ▶ The disinfectant bucket and the rinse bucket will need to be changed regularly so should be easily moved
- ▶ Broad range treatments are not a suitable alternative to a good disinfectant as some pathogens and parasites will survive this
- ▶ Always dispose of disinfectant responsibly



### Appendix 3: A list of disinfectants (up to date at time of publication)

The disinfectants below are recommended by FHI to prevent the spread of aquatic diseases. It is important to research these to ensure they are suitable for your business and that you adopt all relevant health and safety measures.

Disinfectant	Concentration	Contact time
Aqua Des	0.5% concentration (5ml/L of water)	10-30 minutes
Virasure Aquatic	1% concentration (10g/L of water)	2-10 minutes
Steri-7 Xtra	0.5% concentration (5ml/L of water)	20 minutes
Vanoquat	1-2% concentration (10-20ml/L of water)	10-15 minutes
Virkon Aquatic	1% concentration (10g/L of water)	2-10 minutes
Virkon S	1% concentration (10g/L of water)	2-10 minutes
Bio VX	1% concentration (10g/L of water)	15-30 minutes
FAM30	1% concentration (10ml/L of water)	15-30 minutes



## Appendix 4: Biosecurity checklist for contractors

This checklist can be printed and taken to sites to perform a quick assessment of biosecurity when adding or removing livestock.

	Yes	No	N/A
<b>Livestock</b>			
Do you know the source of all fish/plants/invertebrates intended for use?			
Is the pond/aquarium appropriately stocked?			
Are there any compatibility issues?			
<b>Fish health</b>			
Have/will fish be quarantined/prepared for sale appropriately?			
Have fish that have been added been acclimatised appropriately?			
Have fish been visually inspected for disease?			
If disease present, has isolation and treatment been recommended?			
Have fish been treated prophylactically? (i.e. saltwater or freshwater dip)			
Can you recognise the symptoms of KHV and SVC?			
Can the owner recognise the symptoms of KHV and SVC?			
Are there any symptoms of KHV or SVC present?			
Is fish health checked regularly?			
<b>Plant health</b>			
Are plants healthy and not showing any signs of disease?			
<b>Water quality</b>			
Is the source of water appropriate?			
Is the filtration appropriate and functioning?			
Is all other equipment functioning?			
Is the owner aware of the required water quality parameters?			
Are water quality parameters monitored and reviewed?			
Are corrective measures taken if required?			
Does all waste water go to sewage?			
<b>Invasive species</b>			
If a pond, is the site safe from flooding?			
If a pond, can fish escape to surrounding waters?			
Has all equipment (including transport vehicles) been disinfected between jobs			
Have the customer's equipment (i.e nets) been used where possible			
Have any plants been checked for hitchhikers?			
Are the species being kept in the appropriate environment (i.e. no aquarium species outdoors)			





## Appendix 5: How to fill in a COSHH form

COSHH stands for Control of Substances Hazardous to Health and is required when dealing with any hazardous substance (such as treatments). Instructions for each column are below.

**Table 1**

Line ref = Substance number

Substance name = The name of the substance

CAS number = Unique chemical identifier code which can be found online

General hazard codes = Pictorial symbols found on some substances (i.e flammable)

Workplace Exposure Limit (WEL)? = Is there a workplace exposure limit?

Special hazards = A code found on some substances, can be found online

Environmental hazards = A code found on some substances, can be found online

**Table 2**

Line ref = Substance number

Physical form(s) being used= e.g. powder, mist, liquid

Greatest quantity handled, frequency and duration = How much, how often and how long is the substance handled?

Who is at risk? = Who will work with/be near the substance?

Anyone at increased risk? = e.g. young/disabled/pregnant/allergic?

Specific control measures required? =

Correct waste disposal route(s) = How to dispose of waste product

Line Ref.	Substance name	CAS number	General hazard codes	Workplace Exposure Limit (WEL)?	Special hazards	Environmental hazards

Line Ref	Physical form(s) being used	Greatest quantity handled, frequency and duration	Who is at risk?	Anyone at increased risk?	Specific control measures required	Correct waste disposal routes(s)

The COSHH form should be signed and dated by the assessor and have a date for review.



## Appendix 6: Template biosecurity risk assessment

You may want to conduct a risk assessment on a specific biosecurity issue event on your site. Instructions for each column are below and an example for a whitespot outbreak is included in the first line of the table. Add and fill in extra rows for your specific biosecurity risks.

1. Biosecurity risk = Name of issue
2. What might be harmed? = What is at risk?
3. Current controls = What are you currently doing to mitigate this risk?
4. Current risk = Use the risk table below to calculate (chance X risk)
5. Additional controls = What could be done to reduce this risk?
6. Residual risk = Recalculate risk score
7. Date achieved by = Date measure will be implemented

		A	B	C	D	E
		Negligible	Minor	Moderate	Significant	Severe
E	Very Likely	Low Med	Medium	Med Hi	High	High
D	Likely	Low	Low Med	Medium	Med Hi	High
C	Possible	Low	Low Med	Medium	Med Hi	Med Hi
B	Unlikely	Low	Low Med	Low Med	Medium	Med Hi
A	Very Unlikely	Low	Low	Low Med	Medium	Medium

(Kashwani, 2017)

Biosecurity risk	What might be harmed?	Current controls	Current risk	Additional controls	Residual risk	Date achieved by
White spot	Fish on site and customer's home aquarium	*Proper acclimation *Quarantine *Good water chemistry	Medium (possible X moderate)	* Install a UV steriliser on each system	Low-Med (unlikely X moderate)	06/06/2023







DATA  
WESSEX HOUSE  
STATION ROAD  
WESTBURY  
WILTHSIRE  
BA13 3JN  
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